NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: WOrth 2-4155 WOrth 3-6925

FOR RELEASE: UPON DELIVERY
(expected about 12 noon, EST)

RELEASE NO. 61-241

Address by
James E. Webb, Administrator
National Aeronautics and Space Administration
before the
Aero Club of Washington
Washington, D. C.
October 31, 1961

It must be a great satisfaction to the founders of the Aero Club to know that they had the foresight to choose an organization title which would not become obsolete as the science and technology of flight progressed. "Aero," as Webster points out, is a combining form which leaves room for you to add space to your original interest and knowledge in aeronautics.

Today I would like to discuss with you some of the highlights of both the "aero" and "space" aspects of our national program. There is, of course, no clear-cut dividing line between many of the fields of research and development in aeronautics and space. The supersonic airplane, for example, uses atmospheric air for combustion; the rocket carries its own oxidizer--yet jets and rockets have similar fundamental problems of aerodynamics, combustion, and materials. The stratosphere, where jet planes operate merges imperceptibly into "space."

Some of the results of aeronautical research are applicable to spacecraft, and some of the work to develop space propulsion systems and vehicles feeds back into the technology of advanced aircraft. It is vitally important to our security and well-being that the United States achieve and maintain leadership in both these fields.

The National Aeronautics and Space Act of 1958, which established the agency I serve, stipulated:

> "...that activities in space should be devoted to peaceful purposes for the benefit of all mankind."

It is the role of NASA to initiate and support projects to:

Expand human knowledge of the phenomena in the atmosphere and in space;

Improve the usefulness, performance, speed, safety, and efficiency of aeronautical and space vehicles;

Develop and operate space vehicles;

Study the benefits to be gained for mankind through space activities;

Preserve the role of the United States as a leader in aeronautical and space activities for peaceful purposes;

Interchange information between the civilian and military agencies to assure maximum effectiveness of discoveries and know-how for all purposes;

Cooperate with other nations in space activities and in peaceful application of the results;

and

Seek the most effective utilization of scientific and engineering resources of the United States in achieving these goals.

Five months ago, President Kennedy called for a national commitment to a ten-year effort to advance, at the most rapid rate possible, the broad technology of space exploration with maximum advances in science to culminate in a manned expedition to the moon. In his May 25 State of the Union Message, the President said:

> "Now is the time for a great new American enterprise--time for this nation to take a clearly leading role in space achievement..."

The first increment of this program was approved in the last session of Congress. Its implementation involves not one, but a number of Government agencies--including the Department of Defense, the Atomic Energy Commission, the Department of

Commerce, and the National Aeronautics and Space Administration.

Universities are supporting the basic research activity and will supply the program with increasing numbers of qualified scientists and engineers.

American industry is designing and fabricating the boosters, spacecraft, launch facilities, and worldwide tracking stations for the many different types of space missions.

The aeronautics and space program is truly a national effort. The objective of a manned lunar exploration within the shortest time possible requires the planning and fitting together of a large number of actions, a systematic organization of the effort, and a constant evaluation of progress. The results, and the effectiveness of the men and means employed must be constantly reviewed by a leadership capable of hard-boiled adjustment to overcome deficiencies and to exploit opportunities as they may arise.

Historically, our military services have participated in and made great contributions to the development of our resources as a nation, to our great explorations such as the Lewis and Clark Expedition and those in the Antarctic and during the International Geophysical Year. They are now making great contributions to our space effort.

It is, also, an interesting fact that our nation's leaders in aviation and aerodynamic research, who have done so much to provide the foundation for our military and commercial air superiority, through the National Advisory Committee for Aeronautics, are now through its successor agency, NASA, applying their experience, skill, and leadership in this vast new effort. I refer particularly to Dr. Hugh Dryden, Dr. Abe Silverstein, and Ira Abbott. Of course, Joe Walker, and others of X-15 fame are familiar to all of you.

In this same vein, I believe it is important to keep in mind that some of our nation's most outstandingly qualified men who have over the years made great contributions to our national aviation position in universities and in industry have accepted leading roles in our space program.

Dr. Robert Seamans before joining NASA as Associate Administrator, spent fifteen years working with Dr. Charles Draper in the Instrumentation Laboratory for Aeronautics at the Massachusetts Institute of Technology and also taught at that University. He then went on to spend five years with Radio Corporation of America.

Mr. Thomas Dixon, who recently joined us as Deputy to Dr. Seamans, has distinguished himself for more than sixteen years with the Rocketdyne Division of North American Aviation in the development of our most modern propulsion systems for the space age. He rose to Vice President at Rocketdyne.

Mr. Brainerd Holmes, who tomorrow will take up his duties as Director of the Office of Manned Space Flight Programs, has had a distinguished career with the American Telephone and Telegraph Company and the Radio Corporation of America and occupied a leading role in the successful accomplishment of our ballistic missile early warning system.

I could mention many other men in leadership positions in NASA who bring the highest personal, technical, and professional qualifications to this effort, but I mention these three particularly to show that there is a joining in them, as they exercise their responsibility for leadership and management, high technical qualifications in the three major fields of instrumentation, of propulsion, and of electronics. There is the old saying in American industry that if you want to make soap, you have to get a man who knows how to make soap. These men, and many others associated with them, know the technical side of aeronautics and space and are all experienced in the management of large activities. Each has demonstrated a personal earning capacity far beyond what the Government is able to pay for their services. Each is thoroughly familiar with the opportunities and problems associated with our most important technical military weapons system development efforts. It is fortunate for this nation that men with these high qualifications and such experience are willing to forego large earnings in industry and a more normal personal and family life to supply the leadership needed in our national space effort.

Our senior military leaders in these highly technical and complex fields are making the same kind of personal contribution, and the teaming of these civilian and military leaders is taking place in a manner to ensure the success of the program in the best tradition of American public service.

Before this group, it is not necessary to compare the fifty-eight years of man's powered flight in the atmosphere with the four years since man proved his ability to achieve space flight. But it is important to recognize that the lead time of 45 years, from the Wright Brothers to practical jet aircraft, offers us some measure of the magnitude of the technical problems involved. To accomplish all that must be done to mount a successful manned lunar expedition within ten years will require every possible acceleration in technological advances and their application. Research and development in direct and in supporting areas must also be pursued to the utmost of our abilities, and without let-up.

There are a number of important reasons for a national commitment to a large-scale augmented space program:

The United States must master spaceflight in both its unmanned and manned aspects as insurance against finding ourselves with an over-all technology inferior to that which the Russians will develop as they design and build advance spacecraft and work out supporting techniques for manned voyages to the moon. If we were to permit the Russians to surpass us, the time would certainly come, in line with their own announced intentions, when we would find ourselves on the receiving end of their advanced space technology, employed for military and economic pressure.

Space research is a vigorously expanding field, whose growth is comparable to the development of nuclear physics after World War II. The NASA scientific space program involves both manned and unmanned lunar exploration. From the scientific standpoint, exploration of the moon is of great importance. Having no atmosphere, winds, or rains, the moon offers scientists a chance to study the very early matter of the solar system in practically the form in which it existed billions of years ago.

Another important point is that to millions of people, today's space achievements have become a symbol of tomorrow's scientific and technical supremacy. We simply cannot afford a second-best space effort, and we must always keep in mind that the way in which the knowledge produced by space science and technology is put to use will have powerful effects on the minds of men throughout the world. This is the reason that from the outset, our policy has been to share our space knowledge with the world scientific community. We are cooperating with a growing number of nations in many projects to increase knowledge of the earth's environment and of the universe. In these cooperative projects, we do not exchange funds. Each nation agrees on the work to be done, and each then pays its own costs. Each participating nation stands to gain many valuable contributions through interchange of ideas between scientists and scientific organizations in scores of other nations.

Our country and the world will derive great practical benefits from the accelerated space program. In marshalling and developing the scientific and technical resources we will need to accomplish the manned lunar exploration, we will be advancing a technology that is certain to radiate great and diversified benefits to almost every area of industrial and intellectual activity.

The national investment in space exploration is already producing new materials, metals, alloys, fabrics, and compounds which have gone into commercial production. More than 3,200 space-related products have been developed in the United States. They come from the 5,000 companies and research outfits now engaged in missile and space work.

Direct, practical applications of earth--satellite technology promise to return early and outstanding dividends in the form of improved communications and weather-forecasting services.

Many in this audience have, from time to time, sighted NASA's Echo I passive communications satellite, which was launched in 1960. It has been seen, like a bright moving star, by people in most countries. The huge, aluminized plastic sphere, now in orbit for more than a year, has proved that it is possible to transmit telephone and other electronic messages at transoceanic distances by reflecting radio signals from a satellite.

Great interest has been shown by private firms in both the Echo concept and in "active," or "repeater" satellites that can receive messages at one point over the earth's surface and transmit them to another or store them on tape, and later re-transmit them to ground receiving stations.

First among these is Project Relay, for which the Radio Corporation of America is designing and constructing for NASA, an experimental communications satellite to be launched in 1962. Relay satellites will orbit at three to four thousand miles from the earth and will be used to demonstrate intercontinental television as well as telephone communications.

The second project known as "Telestar" is a cooperative agreement between the American Telephone and Telegraph Company and NASA. Two or more active satellites will be built by A.T.&T. at its own expense. They will be launched by NASA, with A.T.&T. paying the costs and with the knowledge gained fully available to advance the state of the art. These will orbit at six to seven thousand miles from the earth. The third project is a very lightweight satellite called SYNCOM, for which NASA also has a contract with the Hughes Aircraft Corporation. SYNCOM will be flown in what has become known as a 24-hour, or synchronous orbit at the height of 22,300 miles. With the right velocity and in an equatorial plane it will appear stationary over a fixed point on the earth. SYNCOM will be launched late next year as another experimental relay link for telephone and telegraph messages.

One expert in the communications industry states that a single satellite, costing about $40,000,000 and placed in a 22,300-mile orbit, could accommodate as much traffic as a $500,000,000 cable system.

Leaders in the communications industry are convinced that communication satellites present an enormous potential for increasing our long-distance communications resources. For the first time, worldwide television becomes foreseeable, and entirely new forms of global communications, such as closed-circuit TV on an international basis, will become possible. In the future, information from any nation may be fed into computers in a central location at costs that may open great opportunities for better factual analysis and decision.

NASA's TIROS series of satellites has demonstrated the possibilities of vastly more accurate and longer-range weather forecasting. TIROS I transmitted nearly 23,000 television pictures of the earth's cloud patterns. TIROS II, launched last November, has transmitted more than 40,000 pictures and has reported important information about the atmosphere and the radiation of solar heat back from the earth.

TIROS III pictures of Storm Eliza in the Pacific and Hurricanes Carla and Esther on the Atlantic and Gulf Coasts were valuable aids to the Weather Bureau in tracking these cyclonic winds and issuing warnings. In fact, TIROS III spotted Esther two days before the giant wind could have been located by other means. NASA also used TIROS III for weather support of Astronaut Girssom's July 21 Mercury suborbital flight.

Arrangements have been made to keep a TIROS weather satellite in orbit at all times until a follow-on system operated by the United States Weather Bureau and based on the Nimbus satellite is brought into being. Congress has appropriated funds for the project, and the Weather Bureau will this year initiate the first steps toward the Nimbus worldwide meteorological network. Meanwhile, an international conference of all nations interested in participating in this new worldwide weather satellite system has been called and will be held within the next few weeks.

A recent report by the House Committee on Science and Astronautics states than "An improvement of only 10 percent in accuracy (of weather forecasting) could result in savings totaling hundreds of millions of dollars annually to farmers, builders, airlines, shipping, the tourist trade, and many other enterprises.

Since January 31, 1958, this country has successfully launched 54 earth satellites, two satellites around the sun, and two deep space probes. Among our most successful experiments to date have been the Pioneer series of space probes. Pioneer V, for example -- launched into solar orbit on March 11 of last year -- was tracked into space to a distance of 22.5

million miles, still the greatest distance any man-made object has been tracked. The satellite sent back scientific data on conditions in space for more than three months until communication contact was lost on June 26, 1960.

We are developing advanced launch vehicles for both scientific missions and for operational systems. They will have greatly improved load-carrying capability for unmanned space experiments such as Ranger which will land instruments on the moon, and Surveyor, a spacecraft that will be able to make a so-called "soft landing" on the moon with more delicate scientific instruments. Also under development are spacecraft that will fly close to Venus and Mars.

The suborbital flights of American Astronauts Alan Shepard and Virgil Grissom this year were important steps in Project Mercury, the first phase in the United States program for manned spaceflight. The flights were made to test the man and our first man-carrying spacecraft, the Mercury. These flights were to determine the quality of the vehicle, its systems, and man's ability to handle them in space. These are necessary steps to putting an astronaut in orbit around the earth.

In our manned spaceflight program, following Project Mercury, is Project Apollo whose ultimate goal is a manned lunar landing. The Apollo spacecraft will be large enough for living and working quarters to accommodate three men.

Apollo will first be placed into an earth orbit by the Saturn launch vehicle which had its first stage test flight last week. This is an eight-cluster stage with a thrust of 1,500,000 pounds. After the Apollo spacecraft is used as a manned earth-satellite laboratory, it will be sent on voyages deeper into space. These will include a three-man expedition around the moon, and finally an actual moon landing and return late in this decade. The Saturn launch vehicle which is now under development will not be powerful enough for circumlunar flight and lunar landing. NASA is developing much larger launch vehicles such as the Nova, which will be almost as tall as the Washington Monument and will deliver thrusts of more than 12 million pounds.

The policy of the present Administration is to press forward in all related areas of science and technology at the most rapid rate that can be justified by the state of the art, without involving the wastefulness of crash programs.

We have analyzed 2,200 separate tasks with respect to possible schedules and probable costs. These elements were fitted into a single master schedule through massive computer runs (PERT) to determine that manned lunar exploration was feasible within the ten-year period. We have found through these studies an acceptable course along which to initiate action, but it is important to recognize that we still face a number of problems which are unresolved and await further research and technological advance.

For those particularly interested in space science, I would like to emphasize that basic science projects have not been subordinated to manned space flight but rather have been increased and given added emphasis as necessary first steps in all our programs. Research that can be conducted here on earth on the scientific and technological problems associated with space has been increased wherever this was the most efficient way to accomplish the desired results.

There have been so many dramatic developments in the space program that people are prone to forget that NASA is pursuing vigorous, basic research in aeronautics. Our research centers concern themselves with everything from pure research on gas-flow phenomena, to applied research on aerodynamic heating, stability, and control of advanced vehicles, and chemical and metallurgical studies of materials, to name only a few.

Among other important areas under intensive research is that of work with advanced experimental aircraft such as the X-15 experimental airplane. All of you have read how new speed and altitude records are being scored by the rocket-powered X-15 in almost every flight. Within the past two weeks, NASA's Joe Walker set a new speed record of 3,920 miles an hour, or a little more than five times the speed of sound. That's about twice the velocity of a bullet. Walker's partner, Major Bob White, not too long ago piloted the X-15 to a record 217,000 feet or about 41 miles altitude.

In the civil aviation field, the sonic barrier stands in the way of greater speed for current jet transports, although those we have today carry passengers to their destinations in little more than half the time required a few years ago. Yet, we know that it is feasible to develop a commerical transport that will fly at three times the speed of sound.

Private industry unaided could not finance the job. The NASA budget for Fiscal Year 1962 contains substantial increases for aeronautics research, including $6,200,000 for research to aid the Federal Aviation Agency in the development of supersonic transport aircraft. This is double the amount for such research in the 1961 budget. NASA work in the supersonic transport field is concerned with aerodynamics, propulsion, structures, and materials, and in supporting research effort by the industry.

To provide for these industry studies, the FAA budget for 1962 includes 11 million dollars.

Recently, the two agencies -- NASA and FAA -- joined with the Department of Defense to look into the subject of supersonic transport development. A Task Force of the three agencies gathered information from industrial and Government sources.

We have reached agreement on certain basic principles for the project. These are that the program is one of Government assistance to industry; that competition should be used to maximum advantage; that direct Government financial assistance should be provided only to the point from which industry can carry on alone; that the civil air carriers should participate actively; and that the maximum feasible recovery of direct Government expenditures should be sought.

It is especially interesting, I think, that the Task Group emphasized this observation: "The B-58 and the B-70 bomber programs and broad earlier research and experience of supersonic flight from which they evolved provide the United States with a unique capability for developing a supersonic transport."

Now, let us turn to industry thinking on the subject of supersonic transports. In the first place, industry estimates that there is a world market for upwards of 200 such planes. As manufacturers envision these planes, they would have a range of 4,000 miles, or roughly the distance between New York and Berlin. They would carry from 100 to 150 passengers and cruise at about 2,000 miles an hour at 70,000 feet.

Considerable research will be required for the design of a wing that will be efficient at both low and high speeds. One idea is for a wing that can be mechanically swept back to a "delta" shape when the plane enters its high speed range. We have already established research programs to study fuselage and wing structural materials that will withstand the heat conditions of Mach 3 flight. It is expected that surface operating temperatures will range from 450 to 600 degrees Fahrenheit at Mach 3.

On the problem of engines -- and this is a problem -- industry representatives believe that a new type must be developed. Present engines are not considered suitable for the supersonic transport, and there is almost unanimous preference for some form of turbofan engine. The greatest power need will be at altitudes over 40,000 feet where the plane accelerates from subsonic into the supersonic speeds.

The primary requirement is to maintain high efficiency over all speed ranges. Ideally, at subsonic speeds, the supersonic transport engine should be as efficient as present jet-transport engines and, at supersonic speeds, nearly twice as efficient. This is a tough requirement, but we do not see serious fundamental obstacles to building such an engine.

In addition to high efficiency, we must with supersonic engines: 1) maintain noise levels little higher than those of current engines; 2) develop thrust reversers for high speed; 3) utilize cheap fuels and lubricants; and 4) solve a host of other problems, many of them undefinable at present. It will take a long time -- probably extending us into the 1970's -- and it will take many millions of dollars.

The proposed supersonic transports can use existing international airports, but will require higher touchdown speeds and longer landing distances than current subsonic jets. It is believed that touchdown speeds will range from 170 to 145 miles per hour with runway lengths of 8,000 to 9,000 feet. These compare with 120 to 130 miles per hour and 6,500 feet for the present subsonic jet aircraft.

One of the problems -- concerning all of us -- that must be overcome in this venture into the supersonic commercial field is that of noise. NASA is progressing with its research on jet noise, to learn more about the mechanisms that cause it, and on methods of suppressing it. Jet noise is not only a community nuisance, but it also causes aircraft structural fatigue and equipment failures. Our research is particularly aimed at reducing further the noise generated by jet engines of the fan type.

Noise of air rushing by the outer skin of an airplane in the so-called "boundary layer" is also a vexing problem today, as evidenced by the tons of acoustic insulation used in high-speed jet transports. This problem will, of course, become even more severe as greater speeds are attained. NASA is working hard on research on boundary layer noise, using both high-speed wind tunnels and in-flight experiments with the X-15 and other flight research vehicles.

Still another aspect of the noise problem is the sonic boom. NASA experimental work has resulted in a good understanding of many of the factors involved. Much additional work is required to gain the information needed to predict accurately the boom expected from supersonic transports. We must determine operating techniques to minimize annoyance on the ground. Fortunately, we have established the fact that sonic booms do not cause problems for other aircraft flying through the boom-pressure wave created by supersonic aircraft.

Safety is another problem that can scarcely be overemphasized. We are constantly engaged in research on such factors as wet runways, improved tires and treads, more efficient braking, and reduction of fire hazards.

Let me tell you a little about some interesting and extremely important studies we have recently made of the effects of slush on runways. At our Langley Research Center, we have a test arrangement in which a 100,000-pound car is accelerated hydraulically and runs down a track at 150 miles an hour. Time after time, an airplane wheel carried by this car has been run through slush at various depthsto find the effects on landing and take-off of our present-day jet aircraft. Some of the discoveries have been surprising.

For example, as little as one-half inch of slush on an airport runway can seriously hamper the take-off of a jet transport. A rough rule of thumb developed from the data obtained in these tests is that for each half inch of slush or water on the runway, approximately 1,000 feet more of ground run is required for a jet transport to take off.

This is the kind of research that might be called "an ounce of prevention." There is no way of giving meaningful statistics or figures but, unquestionably, accidents have been prevented and more will be, as a direct result of this research.

I have touched upon only a few examples of the many problems that NASA is attempting to solve in the field of aeronautics. In the past, unfortunately, our rapid progress to new aerial frontiers has not always been accompanied by full commercial exploitation of the scientific and technical information acquired. We still need to:

...Develop a high degree of versatility in our aircraft, thus eliminating many of the specialized types.

...Increase the maximum-minimum speed ratio.

...Reduce operating costs.

...Provide true all-weather capability.

...Improve the acceptability of the various air vehicles from the viewpoints of noise, safety, and convenience.

...Provide new capabilities, such as vertical take-off which will broaden the usefulness of the machine.

During the next 10 years, NASA research of this nature will provide the foundations for the more useful and more versatile aircraft of the future.

I would like to add a few words about NASA's organization, and funding.

The organization problems of the new program have been acute. However, in the past eight months we have established a pattern that is, at one and the same time, practical and flexible. It takes account of the best abilities of our senior people, establishes strong leadership in our research and operational centers, gears authority and responsibility together, and provides for sensitive but effective command and control of the resources required in the space program.

We have divided our work into four major program categories: 1) advanced research and technology in aeronautics and space; 2) scientific study of the space environment and celestial bodies, through all available disciplines, and by instrumented unmanned satellites and space probes; 3) application of earth satellites to such immediate uses as weather observation, global communication and navigation; and 4) exploration of space by man.

Each of the four NASA Program Directors, within his particular program area, has over-all responsibility for projects, establishes technical guidelines, budgets and programs funds, schedules each project, and evaluates and reports progress.

The Directors of NASA's research and development centers report directly to the Associate Administrator who serves as general manager. In this way, the directors have an increased voice in policy-making and in program decisions.

Looking back at highlights of the past eight months, there was the work involved in evaluating the resources and requirements, integrating our efforts with those of the Department of Defense and other Government agencies, working with the Director of the Budget, the Vice President and the Space Council, and the President, himself, to determine the total range of Executive Branch requirements. There were the approximately thirty appearances before Congressional bodies to justify the President's recommendations; there were the innovations required in the communications satellite field to carry on the research and development to meet governmental requirements and at the same time bring into play, in a manner consistent with the public interest, the very large resources of the principal potential user of any foreseeable system (the American Telephone and Telegraph Company).

For Fiscal Year 1962, the National Aeronautics and Space Administration has a budget of $1,671,750,000. This includes $245,000,000 for construction of new and supporting facilities and $1,220,000,000 for research and development. Eighty percent of the research and development budget goes to industry and to private organizations. Funds for advanced aeronautics and supersonic transport research total about $31,000,000.

The 1962 NASA program is approximately double that for 1961. Funding requirements will double again in 1963 to meet the goals recommended by President Kennedy.

In conclusion, it has been only four years since the first man-made satellite orbited the earth. The rate of change in this new science and technology is tremendous.

The United States program is based on securing for the peaceful benefit of all mankind the positive gains to be attained through an expansion of the knowledge of the universe, the utilization of space for many valuable purposes, the improvement of flight within the atmosphere, and the advancement of our scientific and technological progress at the most rapid rate possible. We now have, I think, a national space effort characterized by initiative on the part of many able men and responsibility on the part of those who had to make the governmental decisions, all in the best tradition of American democracy.

We recognize that our security would be jeopardized if we did not keep up to date but permitted ourselves to slip into a second-best position.

We are determined to make the effort required to be first in aeronautics and space.

END